Exam Software Modeling (401016)
5 June 2014

Part of this exam is based on the following case study:

An open-source community is developing a system called “Sentinel”, which will monitor residential areas to guarantee the safety of the citizens. Sentinel will make use of sensors to detect smoke, fire, or gas leaks in the house. It will also be associated with car alarm systems to detect car thefts attempts, or home security systems to detect burgling attempts. Finally, Sentinel can be installed on mobile phones and smart devices for people to call the police when threatened (like a personal security service) or of unsafe situations (like witnessing a robbery).

To provide the functionalities above, Sentinel will offer the citizen the possibility to create a personal or family profile in the online “Sentinel Social Community”. This way, the citizen can add features and connect installed sensors (e.g. to detect fire at home or in the garage; to subscribe to the personal security service; to monitor where the family cat is at the moment; etc.).
The Sentinel Social Community will also gather security data of different cities or residential areas, and provide a service for the (subscribed) citizens to become aware of how safe is a selected place.

Note: this problem description may be ambiguous and incomplete. In answering the questions, you are free to complete it (if needed) and briefly motivate your assumptions.

Questions about the theory

1. By using the five decision points characterizing software life cycle models, explain the properties of eXtreme Programming life cycle model. [1 point]

2. In which circumstances is ethnography a viable requirements elicitation technique? [0.5 point]

3. For what type of software system would you use state machine diagrams to model functional requirements? [0.5 point]

4. Explain the notion of internal consistency in software design. Also, provide an example using two inconsistent UML design diagrams, and explain why they are inconsistent. [1 point]

5. Define a complexity measure of your choice. Illustrate it by using an example. [0.5 point]

6. What is a service contract? Also, provide an example by using a suitable SoaML diagram. [1 point]

Questions related to the case study

7. For the case study, specify the functional requirements with an UML class diagram. Use additional text to describe your model and your assumptions where needed. [2 points].

8. Create a software design of the system specified in the previous exercise. Use a UML Component diagram to model it. Use additional text to describe your model and your assumptions where needed. [2 point].

9. Complement your software design with the traceability information necessary to document (1) which component interfaces realize which functional requirements, and (2) which components manage which data entities. [1.5 point].

Exam rules:
- No books or reference material.
- No calculator, mobile phones or other electronic device.